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4) NEAR-IR SHIELDING FILM

7)Abstract:

PROBLEM TO BE SOLVED: To provide a near-IR shielding film suitable to be used for an optical filter for a plasma display or the like, having high near-IR shielding property and also visible ray transmitting property, superior in color balance of transmitted color, having practical durability, superior in productivity, and capable of selectively cutting unwanted light in the visible ray region to improve the image quality.

SOLUTION: This film has a multilayered structure formed by laminating a transparent resin film layer, transparent near-IR shielding layer containing a diimmonium compound as a near-IR absorbing dye as the essential component, transparent resin film layer, and transparent tone adjusting layer containing a coloring material for compensating the color tone of the transparent near-IR shielding layer.

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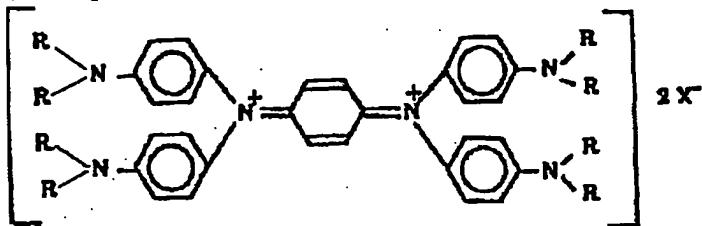
AIMS

aim(s)]

aim 1] The near infrared ray electric shielding film characterized by having the multilayer structure which carried out the laminating a transparency resin film layer (1), the transparency near infrared ray shielding layer (2) which contains a G MONIUMU system compound as a near infrared ray absorbent, and a transparency resin film layer (3) and the transparency color tone compensation layer containing the color material which rectifies the color tone of said transparency near infrared ray shielding layer (2).

aim 2] Said G MONIUMU system compound is a near infrared ray electric shielding film according to claim 1 characterized by what is expressed with the following general formula.

formula 1]



ion with which R is the same or a radical chosen from the hydrogen which is different from each other, an alkyl group, an aryl group, hydroxy group, a phenyl group, and an alkyl halide radical mutually among a formula, and X is chosen from perchloric acid ion, fluoride ion, citric acid ion, hexafluoro arsenate, hexafluoro antimonate ion, trifluoroacetic acid ion, picric-acid ion, benzenesulfonic acid ion, phosphoric-acid ion, sulfate ion, and chloride ion)

aim 3] Wavelength The permeability of a 850-1000nm near infrared ray The average transmission coefficient of a visible ray below % It is L* a* b* more than 65 %. Near infrared ray electric shielding film according to claim 1 with which the color tone in a color coordinate system is characterized by being $-3 \leq a* \leq 3$ and $-3 \leq b* \leq 3$.

aim 4] The near infrared ray electric shielding film according to claim 1 with which said transparency near infrared ray shielding layer, and said transparency resin film layer (3) and said transparency color tone compensation layer (4) are characterized by coming to carry out a laminating to this order. [said transparency resin film layer (1), and]

aim 5] A glass transition point Near infrared ray electric shielding film according to claim 1 characterized by being thermoplastics more than 70 **. [the resin which forms said transparency near infrared ray shielding layer (2) and/or said transparency color tone compensation layer (4)]

aim 6] The near infrared ray electric shielding film according to claim 5 characterized by said thermoplastics being polyester system resin or acrylic resin.

aim 7] The melting point of said G MONIUMU system compound Near infrared ray electric shielding film according to claim 1 characterized by being 190 degrees C or more.

aim 8] Said color material is wavelength. Near infrared ray electric shielding film according to claim 1 characterized by being the color material which absorbs the visible ray of 560 - 590 nm alternatively.

aim 9] The near infrared ray electric shielding film characterized by having carried out the laminating of the transparency adhesive layer (5) containing an ultraviolet ray absorbent to both sides or one side of a near infrared ray electric shielding film according to claim 1 and carrying out the laminating of the mold releasing film layer (6) to it on it.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

001]

[Field of the Invention] This invention relates to the near infrared ray electric shielding film used suitable for especially the light filter or plasma displays about a near infrared ray electric shielding film.

002]

[Description of the Prior Art] Wavelength which is emitted from the former, for example, a plasma display, and causes [of surrounding electronic equipment] malfunction The following is used for electric shielding of the near infrared ray of 850 – 1000 nm, or it is opposed.

) Carry out the multilayer laminating of a metallic-oxide thin film and the metal thin film on a transparency base material, and while the light penetrates using the reflection property of the light of a metal thin film, reflect and cover the light of a near infrared ray field.

) What carries out the multilayer laminating of the thin film with which refractive indexes differ, reflects the light of a specific near infrared ray field on a transparency base material using the interferential action of light, and is covered.

) What absorbs the light of a near infrared ray field by the absorptivity of a copper ion, and is covered with the sheet which carried it the casting polymerization of the compound containing a copper ion to acrylic resin.

) What is made to distribute a near infrared ray absorbent in thermoplastics, carries out thermoforming to the shape of a sheet, and absorbs and covers the light of a near infrared ray field.

) What carries out coating of the resin constituent containing a near infrared ray absorbent to the shape of a sheet on cast shaping a transparency base material, and absorbs and covers the light of a near infrared ray field.

003) [Trouble] However, there were the respectively following troubles in the aforementioned near infrared ray shielding material for plasma displays. Namely, the above (1) and (2) About the near infrared ray shielding material for plasma displays, by selection, each optical thickness, and the count of a laminating of a thin film material, an optical property can be designed freely and desired near infrared ray electric shielding nature can be obtained. However, in order to obtain the advanced electric shielding nature for preventing malfunction of a peripheral device, it is necessary to prepare the layer which needs to make [many] the count of a laminating, and otherwise contains a near infrared ray absorbent when there are few counts of a laminating, and to compensate electric shielding nature, a manufacturing cost becomes very high, and versatility is missing. Moreover, with enlargement of a display, when the membrane formation to the further large area is required, it describes above. (1) and (2) With an optical thin film system ingredient like], since the highly precise homogeneity within a field is required, manufacture becomes difficult.

004) Above (3) About the near infrared ray shielding material for plasma displays, since the absorbing power of the near infrared ray a copper ion is low, in order to obtain advanced electric shielding nature, thickness of a sheet cannot be made thin, but in order for shaping of a sheet to also put an one-sheet one-sheet prepolymer into a mold and to carry out a polymerization, a manufacturing cost becomes high. Moreover, since the transparency color of the sheet itself becomes blue in order to also absorb greatly a part for the light-emitting part of the red of a light field, and a color-balance is spoiled, it is not desirable as a filter for a display.

005) Above (4) About the near infrared ray shielding material for plasma displays, when control of an optical property can carry out unimparatively easily and carries out extrusion molding of the resin which carried out heating fusion from a slit die by selection of the near infrared ray absorbent distributed in thermoplastics, manufacturing cheaply in large quantities is possible. However, since thermal resistance is inferior in the near infrared ray absorbent excellent in both light permeability and near infrared ray absorptivity generally, a manufacture which deteriorated at the process by which heating melting is carried out, and was stabilized is difficult with resin, and when coloring matter excellent in thermal resistance is used, the permeability of a light field becomes low and the brightness fall of a display becomes large.

006) Above (5) About the near infrared ray shielding material for plasma displays, it is the above (4). The deterioration by the heat in the near infrared ray shielding material for plasma displays is avoidable, and its manufacturing cost is also the cheapest and it is excellent in productivity. However, as a near infrared ray absorbent, although the proposal of the combination of various near infrared ray absorbents, such as a G MONIUMU system compound, an aminium system compound, a phthalocyanine system compound, an organometallic complex, a cyanine system compound, an azo compound, a poly methine system compound, a quinone system compound, a diphenylmethane system compound, a triphenylmethane color system compound, and a mercapto naphthol system compound, is performed, in order to obtain advanced electric shielding nature, the permeability of the light is not enough in spoiling the color-balance of a transparency color remarkably. Moreover, when long duration use of the ingredient concerned is carried out whenever [high-humidity/temperature] on the bottom or the outdoors, the electric shielding nature of a near infrared ray falls by composition or deterioration, or the color-balance of a transparency color is spoiled remarkably, and practicality is missing in respect of endurance, such as moisture resistance, thermal resistance, and lightfastness.

007)

[Problem(s) to be Solved by the Invention] The technical problem which this invention was made in view of the trouble which said Prior

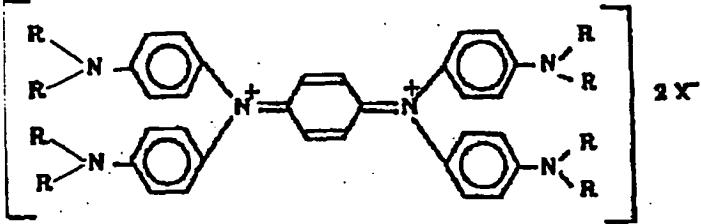
has, and was set up concretely for the reason While using for the light filter for plasma displays etc., having suitable advanced near infrared ray electric shielding nature and light permeability and excelling in the color-balance of a transparency color It has practical lurance, and productivity is good, and it is offering the near infrared ray electric shielding film which covers the unnecessary light of ght field alternatively further, and may raise image quality.

08]

[means for Solving the Problem] The near infrared ray electric shielding film concerning claim 1 in this invention as technical means concretely constituted so that said technical problem could be solved effectively A transparency resin film layer (1) and the transparency near infrared ray shielding layer which contains a G MONIUMU system compound as an indispensable component as a near infrared ray absorbent (2). It is characterized by having the multilayer structure which carried out the laminating of a transparency film layer (3) and the transparency color tone compensation layer (4) containing the color material which rectifies the color tone said transparency near infrared ray shielding layer (2).

09] The near infrared ray electric shielding film applied here at claim 2 is characterized by expressing said G MONIUMU system compound with the following general formula.

[formula 2]



ion with which R is the same or a radical chosen from the hydrogen which is different from each other, an alkyl group, an aryl group, hydroxy group, a phenyl group, and an alkyl halide radical mutually among a formula, and X is chosen from perchloric acid ion, fluoride ion, acid ion, hexafluoro arsenate, hexafluoro antimonate ion, trifluoroacetic acid ion, picric-acid ion, benzenesulfonic acid ion, phosphoric-acid ion, sulfate ion, and chloride ion)

reover, the near infrared ray electric shielding film concerning claim 3 is wavelength. The permeability of the near infrared ray of 850 000 nm It is below 10 % and the average transmission coefficient of a visible ray It is more than 65 %, and is L* a* b*. The color tone a color coordinate system is characterized by being $-3 \leq a* \leq 3$ and $-3 \leq b* \leq 3$. Moreover, as for said transparency near infrared ray shielding layer (2), and said transparency resin film layer (3) and said transparency color tone compensation layer (4), the near infrared ray electric shielding film concerning claim 4 is characterized by coming to carry out a laminating to this order. [said transparency resin film layer (1), and]

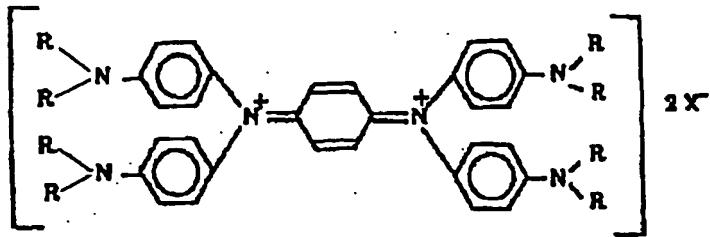
10] Furthermore, a glass transition point the near infrared ray electric shielding film concerning claim 5 It is characterized by being thermoplastics more than 70 **. [the resin which forms said transparency near infrared ray shielding layer (2) and/or said transparency color tone compensation layer (4)] Furthermore, the near infrared ray electric shielding film concerning claim 6 is characterized by said thermoplastics being polyester system resin or acrylic resin. Furthermore, the near infrared ray electric shielding film concerning claim 7 is characterized by the melting point of said G MONIUMU system compound being more than 190 **. Furthermore, for the near infrared ray electric shielding film concerning claim 8, said color material is wavelength. It is characterized by the color material which absorbs a 560-590nm visible ray alternatively. Furthermore, it is characterized by the near infrared ray electric shielding film concerning claim 9 carrying out the laminating of the transparency adhesive layer (5) containing an ultraviolet ray absorbent to aforementioned both sides or aforementioned one side of a near infrared ray electric shielding film, and coming to carry out the laminating of the mold releasing film layer (6) on it.

11]

[embodiment of the Invention] The near infrared ray electric shielding film concerning the gestalt of this operation As shown in drawing coating of the resin constituent which contains the G MONIUMU system compound expressed in said general formula as the transparency resin film layer 1 as a near infrared ray absorbent as an indispensable component is carried out on said transparency resin film layer 1. Formation and the transparency near infrared ray shielding layer 2 by which the laminating was carried out, On this transparency near infrared ray shielding layer 2, formation and the transparency resin film layer 3 by which the laminating was carried out. Coating of the resin constituent containing the color material which rectifies the color tone of said transparency near infrared ray shielding layer 2 is carried out. Formation and the transparency color tone compensation layer 4 by which the laminating was carried out. An ultraviolet ray absorbent is contained and it has the multilayer structure which becomes the upper layer (drawing 1 lower layer) of said transparency resin film layer 1 from formation and the mold releasing film layer 6 by which the laminating was carried out formation, the transparency adhesive layer 5 by which the laminating was carried out, and the upper layer (drawing 1 lower layer) of said transparency adhesive layer 5.

12] By having made it such a configuration, near infrared ray electric shielding nature and light permeability practical [a near infrared ray electric shielding film] as a near infrared ray electric shielding filter for plasma displays and advanced, and the film which has the outstanding color-balance are obtained. Here, the transparency adhesive layer 5 and the mold releasing film layer 6 do not necessarily need to be formed here at the transparency resin film layer 1 side, and may carry out the laminating of the transparency adhesive layer 5 and the mold releasing film layer 6 to this order at the transparency color tone compensation layer 4 top.

13] A G MONIUMU system compound is a compound expressed with the following general formula, and is [Formula 3].



is mutually the same — or — difference — hydrogen and an alkyl group (a methyl group and an ethyl group —) Aryl groups, such as propyl group and butyl, a hydroxy group, a phenyl group, It is an alkyl halide radical etc. X Perchloric acid ion, fluoride boron acid ion, xfluoro arsenate, hexafluoro antimonate acid ion, trifluoroacetic acid ion, Picric-acid ion, benzenesulfonic acid ion, phosphoric-acid i, sulfate ion, It is chloride ion etc. and N, N, N', an N'-tetrakis (p-diethylaminophenyl)-para benzoquinone-screw (potato NIUMU) xfluoro antimonate, etc. can specifically be illustrated. These are the Nippon Kayaku Co., Ltd. make, although it can also be used mpounding suitably. IRG-022, IRG-040, Japan Carlit Co., Ltd. make CIR-1080, CIR-1081, and CIR-1083 grade are marketed and it is possible to use them.

possible to use them.

114] For these G MONIUMU system compounds, molar extinction coefficient epsilon is abbreviation to a near infrared region. 10 It is the big absorption which is about 10,000, and is wavelength. Although the light field of 400 – 500 nm has absorption a little and the color tone of a thin yellowish brown color – green is presented, since light permeability is superior to other near infrared ray sorbents, it uses for said near infrared ray electric shielding film, and is suitable. The loadings of a G MONIUMU system compound is wavelength in order to discover the malfunction prevention function of enough peripheral devices, although it is dependent on the thickness of the transparency near infrared ray shielding layer 2 containing this near infrared ray absorbent. The near infrared ray permeability of 850 – 1000 nm It is necessary to make it become below 10 %. For that purpose, thickness of the transparency near infrared ray shielding layer 2 5-50 Loadings of the near infrared ray absorbent to resin solid content when it designs as a mum grade 1-5.0 What is necessary is just to consider as weight % extent. Since the superfluous combination of a near infrared ray absorbent to a resin which forms the transparency near infrared ray shielding layer 2 causes the segregation of said near infrared ray absorbent in inside of the transparency near infrared ray shielding layer 2, and the fall of light permeability, it is not desirable.

[015] Moreover, wavelength Said G MONIUMU system compound and other near infrared ray absorbents may be blended, the near infrared ray of 850 - 900 nm may be covered, and it is wavelength in this case. Organometallic complexes, the phthalocyanine system compound which has the absorption maximum, a dithiol nickel complex, for example, a screw (dithio-benzyl) nickel complex etc., etc., etc. may be used near 850nm. However, it is better for it to be better to blend these near infrared ray absorbents with the insparence color tone compensation layer 4, and to blend a G MONIUMU system compound independently in the transparency near rared ray shielding layer 2 concerned, since it has the catalysis which the permeability of the former of a light field is low, and the ter returns a G MONIUMU system compound, and is deteriorated.

016] Moreover, the melting point a G MONIUMU system compound to give practical endurance It is desirable to use a thing 190 degrees C or more. The melting point That it is easy to deteriorate downward whenever [high-humidity/temperature], the thing of 190 more degrees C can combine a thing 190 degrees C or less with selection of the below-mentioned suitable resin kind, and it can require practically good endurance.

[017] In order to give practical endurance, a glass transition point the resin which forms the transparency near infrared ray shielding layer 2 and/or the transparency color tone compensation layer 4 It is thermoplastics more than 70 **, and it is desirable that they are polyester system resin or acrylic resin, and the resin of fusibility is preferably good for general-purpose solvents, such as toluene, aethyl ethyl ketone, and methyl isobutyl ketone. The glass transition point of this resin When it is put to the elevated temperature on a front face of a plasma display for a long time that it is under 70 **, the G MONIUMU system compound in the transparency near infrared ray shielding layer 2 tends to receive deterioration at the same time resin becomes soft, and a problem is in long-term stability a color-balance is spoiled or the electric shielding nature of a near infrared ray falls. On the other hand, a glass transition point If it more than 70 **, it will become possible to control deterioration by heat. On the other hand, since the activity reaction radical contained in a component reacts with a G MONIUMU system compound and the optical property of a paint film is spoiled remarkably, a resin of heat-curing molds, such as an epoxy system and an urethane system, cannot be used. As resin which satisfies the above requirements, polyester system resin, acrylic resin, etc. are used suitably.

018] Although the transparency resin film which constitutes the transparency resin film layer 1 and the transparency resin film layer 3 is not limited especially if there is no trouble in light transmission nature when the laminating of aforementioned each class is carried out, a polyester system, acrylic, a polycarbonate system, a cellulose system, an urethane system, etc. are mentioned, and a polyester system and its acrylic are desirable in respect of a refractive-index difference with the transparency near infrared ray shielding layer 2 and the color tone compensation layer 4. Moreover, the thickness of the transparency resin film which constitutes the transparency resin film layer 1 and the transparency resin film layer 3 has desirable 10-125 micrometers from the field of workability and the Hayes hue.

319] In order to carbonate the color tone of the yellowish brown color of said transparency near infrared ray shielding layer 2 containing said G MONIUMU system compound - green and to prepare a color-balance, as for the transparency color tone compensation layer 4, it is desirable to contain color material which serves as those complementary color. As this color material, general things, such as an inorganic system pigment, an organic system pigment, an organic system color, and coloring matter, are mentioned. As an inorganic pigment, a cobalt compound, an iron compound, a chromium compound, etc. are mentioned. As an organic pigment An azo system, an in DORINON system, the Quinacridone system, a bat system, a phthalocyanine system, a naphthalocyanine system, etc. are mentioned. To said organic system color and coloring matter an azo system, an azine system, an anthraquinone system, and indigo — the id, although a system, an oxazine system, a kino FUTARON system, a SUKUWARIUMU system, a stilbene

stem, a triphenylmethane color system, a naphthoquinone system, a PIRAROZON system, a poly methine system, etc. are mentioned organic system pigment is suitably used from the balance of color enhancement and endurance among these.

020] Moreover, it is wavelength as the aforementioned color material. By using for the visible-ray field of 560 - 590 nm the color material which has absorption alternatively, it is desirable to add the function which covers the unnecessary light by luminescence of a neon gas from a plasma display, improves color purity, and improves image quality. An organic system pigment like for example, nethyl Quinacridone is mentioned to such a color material. And it is wavelength in color material. By blending with the field of 850 - 0 nm organometallic complexes, such as a dithiol nickel complex which has the absorption maximum, it is desirable to complement an infrared ray electric shielding nature. And the loadings of several of these sorts of color material are $L^* a^* b^*$ of the near infrared electric shielding film concerned. What is necessary is just to determine loadings from the thickness, the amount of resin solid content, and the amount of color material of said transparency color tone compensation layer (4) so that the color tone in a color ordinate system may be set to $-3 <= a^* <= 3$ and $-3 <= b^* <= 3$.

021] Moreover, in fact, in order to use it, carrying out the laminating of said near infrared ray electric shielding film to other electromagnetic wave shielding films, a reflective antistatic film, etc., when the transmission loss by lamination is taken into consideration, it is desirable [when using a near infrared ray electric shielding film as a light filter for plasma displays, as for the average transmission coefficient of the light, it is desirable to consider as 50 - 60 % from the brightness of a screen and the balance of contrast, but] that they are the light average transmission coefficient of a near infrared ray electric shielding film and more than 65 %. Moreover, in order to improve the moisture resistance and thermal resistance of resin which form a paint film if needed to the transparency near infrared ray shielding layer concerned, a transparency color tone adjustment layer, and a transparency adhesive layer, the antioxidant generally used may be added. Although there are an aromatic amine system, a hindered phenol system, etc. in an antioxidant and various things are marketed, it tends to color and the thing of the former of a hindered phenol system is desirable.

022] It is desirable to form the transparency adhesive layer 5 as an ultraviolet-rays shielding layer which blended the ultraviolet ray sorbent with the binder etc. in them, in order to prevent deterioration of the G MONIUMU system compound by ultraviolet-rays light one of one side or both sides of a near infrared ray electric shielding film and to improve lightfastness to them. A benzophenone stem, a benzotriazol system, etc. are mentioned as an ultraviolet ray absorbent. Moreover, this near infrared ray electric shielding film can be easily stuck on a transparency base material, for example, filter base material etc. through the transparency adhesive layer. Furthermore, when carrying out the laminating of the transparency adhesive layer 5, it is desirable to stick the mold releasing film layers 6, such as a polyethylene system, on the upper layer (adhesive face) in respect of workability.

023] The near infrared ray electric shielding film concerning the gestalt of this operation can be manufactured as follows, for example. First, the transparency resin film A with which the resin which forms the transparency near infrared ray shielding layer 2 was applied to a solvent with the G MONIUMU system compound of the specified quantity etc. on the dissolution or the transparency resin film which carries out distributed processing, prepares a resin constituent, and constitutes the transparency resin film layer 1 for this resin constituent using the usual coating equipments, such as a bar coating machine, a roll coater, and a slit-die coating machine, siccation evaporation of the solvent was carried out, and the laminating of the near infrared ray shielding layer 2 was carried out is. The transparency resin film B with which the resin which forms the transparency color tone compensation layer 4 applied to a solvent with said color material for color tone adjustment etc. on the other hand on the dissolution or the transparency resin film which carries out distributed processing, prepares a resin constituent, and constitutes the transparency resin film layer 3 for this resin constituent using the usual coating equipments, such as a bar coating machine, a roll coater, and a slit-die coating machine, siccation evaporation of the solvent carried out, and the laminating of the color tone compensation layer 4 was carried out forms. In addition, mean particle diameter of color material 0.01-10 It is desirable from the field of transparency, color enhancement, and the ability of a resin constituent with the passage of time that it is within the limits of μm .

024] Subsequently, the laminating of the transparency resin film A and the transparency resin film B is carried out. Under the present circumstances, as for the lamination of both the transparency resin film, it is desirable to carry out a heating lamination at the temperature more than the softening temperature of the resin with which the near infrared ray shielding layer 2 and the color tone compensation layer 4 of the transparency resin film B make the field by which a laminating is not carried out meet, and form the near infrared ray shielding layer 2. In this case, when the fault which the color tone compensation layer 4 softens similarly, and welds to a transparency resin film layer 3 arises, the heating lamination of the transparency resin film A and the transparency resin film which constitutes the transparency resin film layer 3 is carried out beforehand, and the laminating of the color tone adjustment layer 4 may be carried out to transparency resin film front face after that. Moreover, even if it carries out the sequential lamination of the transparency resin film A and the transparency resin film B and makes it the above-mentioned laminating gestalt, it does not interfere with the front face of a transparency base material, for example, the front-face plate of a plasma display.

025] In addition, when the near infrared ray shielding layer 2 of the transparency resin film A and the color tone compensation layer 4 the transparency resin film B are made to meet and a laminating is carried out, or when the laminating of the transparency resin film A and the transparency resin film B is carried out so that the near infrared ray shielding layer 2 may be exposed, and the transparency adhesive layer 5 is formed on the near infrared ray shielding layer 2, in any case, deterioration of a G MONIUMU system compound tends to be promoted whenever [high-humidity/temperature] in the bottom. Thus, the manufactured near infrared ray electric shielding film can be used suitable [other than the light filter for plasma displays] for for example, the heat ray electric shielding glass for automobiles, multiple glass, etc.

026].

[example] Hereafter, an example and the example of a comparison are explained concretely. In addition, the measuring method of the physical property of a sample with which the laminating of the near infrared ray electric shielding film obtained in each example and the example of a comparison was carried out, and the evaluation approach of endurance are as follows.

Measurement of total light transmission and the Hayes value) Hazemeter made from Tokyo Denshoku Industry MODEL TC-H3DPK It was used and started from each sample. The total light transmission T of the test piece of a 60 x 60 mm angle and the Hayes value H were measured. Each numeric value carried out comparison contrast of the permeability of indoor air, and the Hayes value.

27] (Measurement of a color tone) Color analyzer made from Tokyo Denshoku Industry It started from each sample using TOPSCAN -1800-MK II. L* a* b* of the test piece of a 60 x 60 mm angle L* of a color coordinate system, a*, and b* The value was measured. In addition, it measured at D65 and **2 degrees of incident angles as a standard light.

28] (Measurement of spectral transmittance) Spectrophotometer by Jasco Corp. V-570 It used and started from each sample. Test piece of a 60 x 60mm angle The permeability T850 in 850nm, 900 nm, and 1000 nm, T900, and T 1000 It measured. Each numeric value considered the permeability of indoor air as comparison contrast.

29] (Damp-proof evaluation) the Tokyo Rikakikai Co., Ltd. make — constant temperature — constant humidity tester KCH-1000 1g — temperature 60 ** and humidity it is set as 90 %RH — 1000 The variation of each measured value of T of each sample after a time amount trial, H, L*, a*, b*, T850, T900, and T1000 made the thing of less than two points O, and made the thing of two points or more x.

30] (Heat-resistant evaluation) the Isuzu Factory constant temperature humidistat — using — temperature it is set as 80 ** — 10 T of each sample after a time amount trial, H, L*, a*, b*, T850, T900, and T 1000 The variation of each measured value made the thing of less than two points O, and made the thing of two points or more x.

31] (Light-fast evaluation) xenon fade meter made from HEREUSU SUNTEST CPS+ using — illuminance 500 W/m² and temperature it is set as 60 ** — the variation of each measured value of T of each sample after a 400-hour trial, H, L*, a*, b*, T850, 10, and T1000 made the thing of less than two points O, and made the thing of two points or more x. In addition, when an ultraviolet absorption layer was prepared only in one side, it examined so that ultraviolet rays might be irradiated from an ultraviolet absorption side.

32] [Example 1] Commercial saturation copolymerized polyester resin (glass-transition-temperature 70 **) : 15 Weight section, as a near infrared ray absorbent — a G MONIUMU system compound (N, N, N', and N' — a -tetrakis (p-diethylaminophenyl)-para-isoquinone-screw (potato NIUMU) hexafluoro antimonate —) Melting point 200 degree-C:0.2 About the weight section, they are 1:1 partially aromatic solvents of a methyl ethyl ketone and toluene. : 84.8 The resin constituent which carried out dissolution mixing in the weight section The thickness of a dry paint film on a commercial polyethylene terephthalate film (48-micrometer thickness) 20 Transparency resin film with which coating was carried out so that it might be set to mum, and the laminating of the near infrared ray shielding layer which contains a G MONIUMU system compound as a near infrared ray absorbent was carried out A1 It obtained.

33] Moreover, said saturation copolymerized polyester resin (glass-transition-temperature 70 **) : 15 Weight section, It is a screw (biphenyl benzyl) nickel complex as a near infrared ray absorbent. : 0.15 Weight section, Purple organic system pigment which carried out distributed processing beforehand (Fastogen Super Violet RN by Dainippon Ink & Chemicals, Inc.) : 0.05 The weight section and blue organic system pigment (Lionol Blue ES by TOYO INK MFG. CO., LTD.) : 0.025 weight section 1:1 partially aromatic solvents of a methyl ethyl ketone and toluene: 84.775 The resin constituent which carried out dissolution mixing in the weight section The thickness of a dry paint film on said polyethylene terephthalate film (48 mum thickness) 10 Transparency resin film with which coating was carried out so that it might be set to mum, and the laminating of the color tone compensation layer was carried out B1 It obtained.

34] Subsequently, this transparency resin film B1 On said color tone compensation layer, it is an ultraviolet ray absorbent TINUVIN 384 made from tiba SUPESHARUTI KEMIKARUZU. : 2.7 weight section, Anti-oxidant (product made from tiba SUPESHARUTI KEMIKARUZU IRGANOX-1010) : The 0.9 weight sections, Acrylic binder (Toagosei Aron S-1601) : 96.4 The thickness of a dry paint film the mixture which mixed and obtained the weight section 15 The laminating of the transparency adhesive layer which carries out coating and contains an ultraviolet ray absorbent so that it may be set to mum was carried out.

35] Color tone adjustment film which performed this adhesion processing B1 About an adhesive face, it is thickness by the roll laminator. It sticks on a 3mm tempered glass base material. Furthermore, G MONIUMU system compound coating film A1 So that the heating side of a G MONIUMU system compound coating film and the transparency resin film plane of a color tone adjustment film may be set. It is temperature to a tempered glass base material. The sample 1 which carries out a heating lamination at 140 degrees C and by which the laminating of the near infrared ray electric shielding film as an example 1 was carried out on the tempered glass base material was obtained. The initial optical property of this sample 1 and the optical property after each durability test were measured, respectively, and that result was summarized in Table 1.

36] [Example 2] Commercial acrylic resin (glass transition temperature 105 degrees C) : 15 Weight section, It is a G MONIUMU system compound (Nippon Kayaku Co., Ltd. make IRG-040, the melting point 246 degrees C) as a near infrared ray absorbent. : The 0.3 weight sections 1:1 partially aromatic solvents of a methyl ethyl ketone and toluene: 84.7 The thickness of a dry paint film the resin constituent which carried out dissolution mixing on a commercial Pori methacrylic resin film (50 mum thickness) in the weight section Coating is carried out so that it may be set to mum. Transparency resin film with which the laminating of the near infrared ray shielding layer containing a near infrared ray absorbent G MONIUMU system compound was carried out A2 was obtained.

37] Next, this transparency resin film A2 Said near infrared ray shielding layer is minded for said another Pori methacrylic resin film (50 mum thickness), and it is temperature. The heating lamination was carried out at 180 degrees C, and the laminate film was obtained. Subsequently, said acrylic resin: 15 Weight section, The purple organic system pigment which carried out distributed processing beforehand (Fastogen Super Violet RN by Dainippon Ink & Chemicals, Inc.): The 0.05 weight sections and blue organic system pigment (Lionol Blue ES by TOYO INK MFG. CO., LTD.) : The 0.025 weight sections 1:1 partially aromatic solvents of a methyl ethyl ketone and toluene The thickness of a dry paint film the resin constituent which carried out dissolution mixing on said laminate film in the 84.925 weight sections 10 Laminate film with which coating was carried out so that it might be set to mum, and the laminating of the color tone adjustment layer was carried out B-2 It obtained.

38] On this color tone adjustment layer, on the surface of a mold releasing film (polyethylene film), beforehand Furthermore, the ultraviolet ray absorbent (TINUVIN 384 made from tiba SUPESHARUTI KEMIKARUZU):2.7 weight section, Anti-oxidant (product made from tiba SUPESHARUTI KEMIKARUZU IRGANOX-1010) : The 0.9 weight sections, Acrylic binder (Toagosei Aron S-1601) : 96.4 The texture which mixed and obtained the weight section The thickness of a dry paint film 15 The adhesive face containing the ultraviolet ray absorbent of the mold releasing film which carried out coating so that it might be set to mum was stuck with the roll laminator, and is used as the near infrared ray electric shielding film as an example 2. It is thickness, exfoliating said mold releasing film in the near

frared ray electric shielding film of this example 2 using roll laminator equipment. It stuck on the 3mm tempered glass base material, and considered as the sample 2. The initial optical property of this sample 2 and the optical property after each durability test were measured, respectively, and that result was summarized in Table 1.

1039] [Example 3] Organic system pigment used for the color tone adjustment layer 4 (Clariant Japan Hostaparm Red-Violet ER-02): according to the example 1, the sample 3 by which the laminating of the near infrared ray electric shielding film as an example 3 was carried out on the tempered glass base material was obtained except having used the 0.075 weight sections. The initial transparency spectrum of this sample 3 was shown in drawing 2. Moreover, the initial optical property of this sample 3 and the optical property after each durability test were measured, respectively, and that result was summarized in Table 1.

1040] [Example 1 of a comparison] Commercial saturation copolymerized polyester resin (glass-transition-temperature 65 **): 15 weight section, the G MONIUMU system compound (N, N, N', and N' — a - tetrakis (p-diethylaminophenyl)-para benzoquinone-screw (potato NIUMU) hexafluoro antimonate —) of a near infrared ray absorbent Melting point 200 degrees C : The 0.2 weight sections, screw (dithio benzyl) nickel complex of a near infrared ray absorbent: 0.20 Weight section, Phthalocyanine system compound of a near infrared ray absorbent: 0.10 The weight section 1:1 partially aromatic solvents 84.8 of a methyl ethyl ketone and toluene The thickness of a dry paint film the resin constituent which carried out dissolution mixing on a commercial polyethylene terephthalate film (48 mum thickness) in the weight section 20 Coating was carried out so that it might be set to mum.

1041] Subsequently, coating was carried out to the coating side of this film, and the field of the opposite side, and adhesion processing was performed to them so that it might be set to ultraviolet ray absorbent (TINUVIN 384 made from tiba SUPESHARUTI KEMIKARUZU): mum. The 2.7 weight sections, antioxidant (IRGANOX-1010) : 0.9 weight section, acrylic binder (Toagosei Aron S-1601) : 3.4 The thickness of a dry paint film the mixture which mixed and obtained the weight section 15 About the adhesive face of the film which performed this adhesion processing, it is thickness by the roll laminator. It stuck on the 3mm tempered glass base material, and considered as the sample 4. The initial optical property of this sample 4 and the optical property after each durability test were measured, respectively, and that result was summarized in Table 1.

1042] [the example 2 of a comparison] — G MONIUMU system compound of the commercial acrylic resin weight section and a near infrared ray absorbent: 20 (N, N, N', and N' — a - tetrakis (p-diethylaminophenyl)-para benzoquinone-screw (potato NIUMU) hexafluoro antimonate —) Melting point 200 degree-C:0.07 The weight section, screw (dithio benzyl) nickel complex of a near infrared ray absorbent: It is a methyl ethyl ketone about the 0.07 weight sections. : The resin constituent which dissolved in the 79.84 weight sections A solvent is volatilized on a stainless plate by the cast method, and it is thickness. 50 It considered as the film of mum.

1043] Subsequently, to this film, it is an ultraviolet ray absorbent (TINUVIN 384 made from tiba SUPESHARUTI KEMIKARUZU IRGANOX-1010) : The 7 weight sections, anti-oxidant (product made from tiba SUPESHARUTI KEMIKARUZU IRGANOX-1010) : 0.9 weight section, acrylic binder (Toagosei Aron S-1601) : 96.4 The thickness of a dry paint film the mixture which mixed and obtained the weight section 15 Coating was carried out and adhesion processing was performed so that it might be set to mum. About the adhesive face of the film which performed this adhesion processing, it is thickness by the roll laminator. It stuck on the 3mm tempered glass base material, and considered as the sample 5. The initial optical property of this sample 5 and the optical property after each durability test were measured, respectively, and that result was summarized in Table 1.

1044] [the example 3 of a comparison] — the commercial acrylic resin 100 weight section — receiving — G MONIUMU system compound of a near infrared ray absorbent: (N, N, N', and N' — a - tetrakis (p-diethylaminophenyl)-para benzoquinone-screw (potato NIUMU) hexafluoro antimonate —) Melting point 200 degrees C : The 0.005 weight sections, screw (dithio benzyl) nickel complex of a near infrared ray absorbent: The 0.005 weight sections are added. Whenever [cylinder internal temperature / of an injection molding machine] It kneads to homogeneity as 220 degrees C, and is thickness by heating extrusion molding. It fabricated 4mm in the shape of sheet, and this was made into the sample 6. The initial optical property of this sample 6 and the optical property after each durability test were measured, respectively, and that result was summarized in Table 1.

1045]

Table 1]

試験 番号	初期性状						耐久性状		
	T(%)	H(%)	L*	a*	b*	I ₅₈₀ (%)	I ₅₀₀ (%)	I ₄₀₀ (%)	
実施例1	65.6	2.6	83.8	0.2	-2.7	7	4	4	
実施例2	66.1	1.2	84.1	-0.8	-2.6	7	3	4	
実施例3	69.5	2.0	85.7	0	2.5	8	4	5	
比較例1	58.4	2.0	78.6	-0.2	2.4	7	5	4	
比較例2	63.0	2.1	81.4	-5.9	7.5	6	4	4	
比較例3	74.8	1.1	88.9	-6.8	8.8	10	15	16	

046] The result of the "evaluation result" table 1 shows that the sample 1 concerning an example 1 – an example 3 – a sample 3 all have advanced near infrared ray electric shielding nature and light permeability, and a good color-balance in an initial property. Moreover, it turns out that each variation [each of] of each optical property after each durability test is less than two points, and, as for the sample 1 concerning an example 1 – an example 3 – a sample 3, has practical endurance. Furthermore, it turns out that it has selective-absorption nature a sample 3 and focusing on 580 nm.

047] On the other hand, although the sample 4 in which the color tone amendment layer concerning the example 1 of a comparison is prepared has advanced near infrared ray electric shielding nature and a good color-balance in an initial property, light permeability is low, and things understand it, and it has the problem in practical endurance from the optical property change after each trial. Moreover, although the sample 5 in which the color tone compensation layer concerning the example 2 of a comparison is not prepared is advanced near infrared ray electric shielding nature in an initial property, it is understood that light permeability is low and ** and a color-balance are bad, and has the problem in practical endurance from change of the optical property after moisture resistance and a radiationproofing test. Furthermore, although light permeability is high in an initial property, that a color-balance is bad understands the sample 5 in which the color tone compensation layer concerning the example 3 of a comparison and the ultraviolet ray absorbent content layer are not prepared to be near infrared ray electric shielding nature, and it has the problem in practical endurance from change of the optical property after moisture resistance and a radiationproofing test.

048]

ffect of the Invention] as mentioned above, with the near infrared ray electric shielding film concerning claim 1 by this invention A transparency resin film layer (1) and the transparency near infrared ray shielding layer which contains a G MONIUMU system compound a near infrared ray absorbent (2). By having the multilayer structure which carried out the laminating of a transparency resin film layer (3) and the transparency color tone compensation layer (4) containing the color material which rectifies the color tone of said transparency near infrared ray shielding layer (2) While combining advanced near infrared ray electric shielding nature and light permeability and excelling in the color-balance of a transparency color It has practical endurance and productivity is good, it uses for a light filter for plasma displays which covers the unnecessary light of a light field alternatively further, and may raise image quality, d a suitable near infrared ray electric shielding film is made.

049] With the near infrared ray electric shielding film concerning claim 2, for said G MONIUMU system compound, since it is the compound expressed with a general formula [-izing 1], molar extinction coefficient epsilon is about 10 to a near infrared ray field. It has a big absorbing power which is about 10,000, and light permeability is superior to other near infrared ray absorbents, and can use it itably as a near infrared ray electric shielding film.

050] With the near infrared ray electric shielding film concerning claim 3, it is wavelength. The permeability of a 850-1000nm near rared ray Below 10 % The average transmission coefficient of a visible ray It is $L^* a^* b^*$ more than 65 %. The color tone in a color ordinate system by being $-3 \leq a^* \leq 3$ and $-3 \leq b^* \leq 3$ The malfunction prevention function of a peripheral device can fully be monstated, and it can be suitably used as a near infrared ray electric shielding film excellent in the color-balance.

051] By coming to carry out a laminating to this order, said transparency near infrared ray shielding layer (2), and said transparency sin film layer (3) and said transparency color tone compensation layer (4) have practical near infrared ray electric shielding nature d light permeability, and the outstanding color-balance, and can constitute the near infrared ray electric shielding film excellent in durance from a near infrared ray electric shielding film concerning claim 4. [said transparency resin film layer (1), and]

052] A glass transition point with the near infrared ray electric shielding film concerning claim 5 By being thermoplastics more than **, deterioration of a G MONIUMU system compound can be controlled and practical endurance can be raised. [the resin which ms said transparency near infrared ray shielding layer (2) and/or said transparency color tone compensation layer (4)]

053] With the near infrared ray electric shielding film concerning claim 6, when said thermoplastics is polyester system resin or rylic resin, a suitable near infrared ray electric shielding film can be obtained in respect of the transparency of a transparency near rared ray shielding layer (2) and a transparency color tone compensation layer (4), the solubility to a solvent, and coating nature.

054] With the near infrared ray electric shielding film concerning claim 7, the melting point of said G MONIUMU system compound By ing 190 degrees C or more, lower deterioration can be controlled whenever [high-humidity/temperature], it can combine with lection of a suitable resin kind, and practically good endurance can be acquired.

055] With the near infrared ray electric shielding film concerning claim 8, said color material is wavelength. By being the color material which absorbs the visible ray of 560 - 590 nm alternatively, the unnecessary light by neon gas luminescence from a plasma display can intercepted, color purity can be improved, and image quality can be improved.

056] With the near infrared ray electric shielding film concerning claim 9, by having carried out the laminating of the transparencyhesive layer (5) containing an ultraviolet ray absorbent to both sides or one side of a near infrared ray electric shielding film cording to claim 1, and having carried out the laminating of the mold releasing film layer (6) to it on it, while being able to stick a near rared ray electric shielding film on a base material easily, deterioration of the G MONIUMU system compound by ultraviolet rays can prevented, and lightfastness can be improved.

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NOTICES *

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In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

Brief Description of the Drawings]

rawing 1] It is the cross-section explanatory view showing the configuration of the near infrared ray electric shielding film by this invention.

rawing 2] It is the graph which shows the initial transparency spectrum of the sample 3 obtained in the example 3 in this invention.

[Translation done.]

NOTICES *

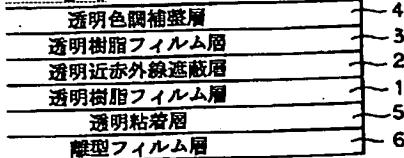
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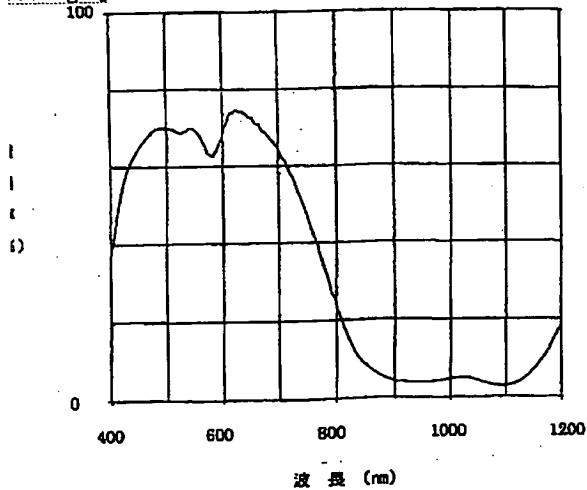
In the drawings, any words are not translated.

DRAWINGS

Drawing 1]



Drawing 2]



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ヨーロッパ特許局

EUROPEAN PATENT OFFICE

Patent Abstracts of Japan

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APPLICANT : SUMITOMO OSAKA CEMENT CO LTD;

INVENTOR : YOSHIKAWA TOSHIHARU;

INT.CL. : G02B 5/22 G09F 9/00

TITLE : NEAR-IR SHIELDING FILM

ABSTRACT : PROBLEM TO BE SOLVED: To provide a near-IR shielding film suitable to be used for an optical filter for a plasma display or the like, having high near-IR shielding property and also visible ray transmitting property, superior in color balance of transmitted color, having practical durability, superior in productivity, and capable of selectively cutting unwanted light in the visible ray region to improve the image quality.

SOLUTION: This film has a multilayered structure formed by laminating a transparent resin film layer, transparent near-IR shielding layer containing a diimonium compound as a near-IR absorbing dye as the essential component, transparent resin film layer, and transparent tone adjusting layer containing a coloring material for compensating the color tone of the transparent near-IR shielding layer.

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最終頁に続く

(54)【発明の名称】 近赤外線遮蔽フィルム

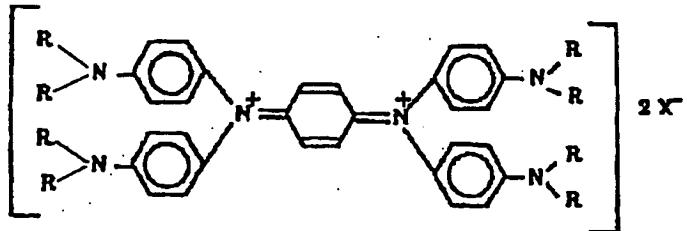
(57)【要約】

【課題】 プラズマディスプレイ用光学フィルター等に用いて好適な、高度な近赤外線遮蔽性と可視光透過性を兼備し、透過色のカラーバランスに優れるとともに、実用的な耐久性を有し、且つ生産性が良好であり、更には可視光領域の不要光を選択的に遮蔽して画質を向上させ得る近赤外線遮蔽フィルムを提供することを課題とする。

【解決手段】 透明樹脂フィルム層と、近赤外線吸収色素としてジイモニウム系化合物を必須成分として含有する透明近赤外線遮蔽層と、透明樹脂フィルム層と、前記透明近赤外線遮蔽層の色調を補整する色材を含有する透明色調補整層とを積層した多層構造を有するように構成する。

【特許請求の範囲】

【請求項1】透明樹脂フィルム層(1)と、近赤外線吸収剤としてジイモニウム系化合物を含有する透明近赤外線遮蔽層(2)と、透明樹脂フィルム層(3)と、前記透明近赤外線遮蔽層(2)の色調を補整する色材を含有する透明色調補整層(4)とを積層した多層構造を有す



(式中、Rは互いに同一若しくは相異なる水素、アルキル基、アリール基、ヒドロキシ基、フェニル基、ハロゲン化アルキル基より選ばれる基であり、Xは過塩素酸イオン、フッ化硼素酸イオン、ヘキサフルオロ硫酸イオン、ヘキサフルオロアンチモン酸イオン、トリフルオロ酢酸イオン、ピクリン酸イオン、ベンゼンスルホン酸イオン、リン酸イオン、硫酸イオン、塩化物イオンから選ばれる陰イオン)

【請求項3】波長850～1000 nmの近赤外線の透過率が10%以下、可視光線の平均透過率が65%以上、L* a* b* 表色系における色調が、-3≤a*≤3、且つ-3≤b*≤3であることを特徴とする請求項1記載の近赤外線遮蔽フィルム。

【請求項4】前記透明樹脂フィルム層(1)と、前記透明近赤外線遮蔽層(2)と、前記透明樹脂フィルム層(3)と、前記透明色調補整層(4)とが、この順に積層されてなることを特徴とする請求項1記載の近赤外線遮蔽フィルム。

【請求項5】前記透明近赤外線遮蔽層(2)及び/または前記透明色調補整層(4)を形成する樹脂が、ガラス転移点が70℃以上の熱可塑性樹脂であることを特徴とする請求項1記載の近赤外線遮蔽フィルム。

【請求項6】前記熱可塑性樹脂がポリエチル系樹脂、アクリル系樹脂のいずれかであることを特徴とする請求項5記載の近赤外線遮蔽フィルム。

【請求項7】前記ジイモニウム系化合物の融点が190℃以上であることを特徴とする請求項1記載の近赤外線遮蔽フィルム。

【請求項8】前記色材が波長560～590 nmの可視光線を選択的に吸収する色材であることを特徴とする請求項1記載の近赤外線遮蔽フィルム。

【請求項9】請求項1に記載の近赤外線遮蔽フィルムの両面又は片面に、紫外線吸収剤を含有する透明粘着層(5)を積層し、その上に離型フィルム層(6)を積層したことを特徴とする近赤外線遮蔽フィルム。

【発明の詳細な説明】

【0001】

ることを特徴とする近赤外線遮蔽フィルム。

【請求項2】前記ジイモニウム系化合物は、次の一般式で表されることを特徴とする請求項1記載の近赤外線遮蔽フィルム。

【化1】

【発明の属する技術分野】本発明は、近赤外線遮蔽フィルムに関し、特にプラズマディスプレイ用光学フィルタに好適に用いられる近赤外線遮蔽フィルムに関する。

【0002】

【従来の技術】従来、例えば、プラズマディスプレイから放射されて、周辺の電子機器の誤動作の原因となる波長850～1000 nmの近赤外線の遮蔽には、以下のようなものが用いられ、或いは提案されている。

(1) 透明基材上に金属酸化物薄膜と金属薄膜を多層積層し、金属薄膜の光の反射特性を利用して可視光は透過しながら近赤外線領域の光を反射して遮蔽するもの。

(2) 透明基材上に屈折率の異なる薄膜を多層積層し、光の干渉作用を利用して特定の近赤外線領域の光を反射して遮蔽するもの。

(3) アクリル系樹脂に銅イオンを含有する化合物を注型重合させたシートで、銅イオンの吸収性により近赤外線領域の光を吸収して遮蔽するもの。

(4) 熱可塑性樹脂中に近赤外線吸収剤を分散させてシート状に熱成形し、近赤外線領域の光を吸収して遮蔽するもの。

(5) 近赤外線吸収剤を含有する樹脂組成物をシート状にキャスト成形、或いは透明基材上に塗工して、近赤外線領域の光を吸収して遮蔽するもの。

【0003】【問題点】しかし、前記のプラズマディスプレイ用近赤外線遮蔽材料には、それぞれ以下のようないくつかの問題点があった。即ち、前記(1)及び(2)のプラズマディスプレイ用近赤外線遮蔽材料については、薄膜材料の選択とそれぞれの光学膜厚及び積層回数により、光学特性を自由に設計することができ、所望の近赤外線遮蔽性を得ることができる。しかしながら、周辺機器の誤動作を防止するための高度な遮蔽性を得るために、積層回数を多くする必要があり、また積層回数が少ない場合は、他に近赤外線吸収剤を含有する層を設け遮蔽性を補う必要があり、製造コストが非常に高くなり、汎用性に欠ける。また、ディスプレイの大型化に伴ない更なる大面积への成膜が必要な場合は、前記(1)及び(2)のような光学薄膜系材料では高精度の面内均一性が要求される。

ため、製造が困難となる。

【0004】前記(3)のプラズマディスプレイ用近赤外線遮蔽材料については、銅イオンの近赤外線の吸収能が低いため、高度な遮蔽性を得るためにシートの厚みを薄くすることができず、シートの成形も一枚一枚プレポリマーを型に入れて重合させるため、製造コストが高くなる。また、可視光領域の赤色の発光部分も大きく吸収するため、シートそのものの透過色が青色になりカラーバランスが損なわれるため、ディスプレイ用のフィルターとして好ましくない。

【0005】前記(4)のプラズマディスプレイ用近赤外線遮蔽材料については、熱可塑性樹脂中に分散する近赤外線吸収剤の選択により、光学特性の制御が比較的容易に行え、加熱溶融した樹脂をスリットダイから押出し成形することにより、大量に安価に製造することが可能である。しかしながら、可視光透過性と近赤外線吸収性の両方に優れた近赤外線吸収剤は概して耐熱性が劣るため、樹脂とともに加熱溶融される工程で変質してしまい、安定した製造が困難であり、また耐熱性に優れた色素を用いた場合は、可視光領域の透過性が低くなり、ディスプレイの輝度低下が大きくなる。

【0006】前記(5)のプラズマディスプレイ用近赤外線遮蔽材料については、前記(4)のプラズマディスプレイ用近赤外線遮蔽材料における熱による変質は回避でき、製造コストも最も安価で生産性に優れている。しかしながら近赤外線吸収剤として、ジイモニウム系化合物、アミニウム系化合物、フタロシアニン系化合物、有機金属錯体、シアニン系化合物、アゾ化合物、ポリメチン系化合物、キノン系化合物、ジフェニルメタン系化合物、トリフェニルメタン系化合物、メルカプトナフタル系化合物等、様々な近赤外線吸収剤の組み合わせの提

案が行われているが、高度な遮蔽性を得るために、透過色のカラーバランスが著しく損なわれたり、可視光の透過性が十分でない。また、当該材料を高温高湿度下又は屋外で長時間使用すると、分解や変質により近赤外線の遮蔽性が低下したり、透過色のカラーバランスが著しく損なわれたりして、耐湿性、耐熱性、耐光性等の耐久性の面で実用性に欠ける。

【0007】

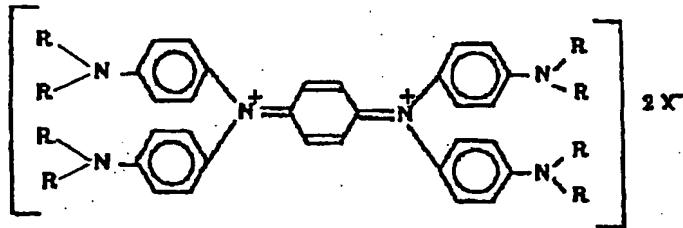
【発明が解決しようとする課題】本発明は、前記従来の技術が有する問題点に鑑みてなされたものであり、その為に具体的に設定された課題は、プラズマディスプレイ用光学フィルター等に用いて好適な、高度な近赤外線遮蔽性と可視光透過性を兼備し、透過色のカラーバランスに優れるとともに、実用的な耐久性を有し、且つ生産性が良好であり、更には可視光領域の不要光を選択的に遮蔽して画質を向上させ得る近赤外線遮蔽フィルムを提供することである。

【0008】

【課題を解決するための手段】前記課題を効果的に解決できるように具体的に構成した技術的手段としての、本発明における請求項1に係る近赤外線遮蔽フィルムは、透明樹脂フィルム層(1)と、近赤外線吸収剤としてジイモニウム系化合物を必須成分として含有する透明近赤外線遮蔽層(2)と、透明樹脂フィルム層(3)と、前記透明近赤外線遮蔽層(2)の色調を補整する色材を含有する透明色調補整層(4)とを積層した多層構造を有することを特徴とするものである。

【0009】ここに、請求項2に係る近赤外線遮蔽フィルムは、前記ジイモニウム系化合物が次の一般式で表されることを特徴とする。

【化2】



(式中、Rは互いに同一若しくは相異なる水素、アルキル基、アリール基、ヒドロキシ基、フェニル基、ハロゲン化アルキル基より選ばれる基であり、Xは過塩素酸イオン、フッ化硼素酸イオン、ヘキサフルオロ硫酸イオン、ヘキサフルオロアンチモン酸イオン、トリフルオロ酢酸イオン、ピクリン酸イオン、ベンゼンスルホン酸イオン、リン酸イオン、硫酸イオン、塩化物イオンから選ばれる陰イオン)

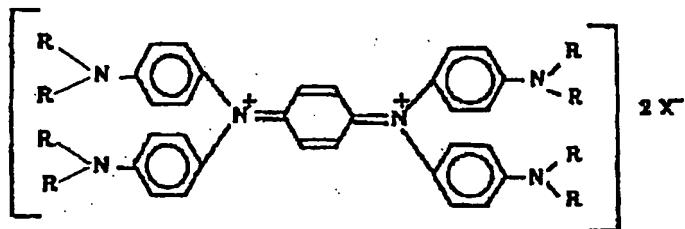
また、請求項3に係る近赤外線遮蔽フィルムは、波長850~1000 nmの近赤外線の透過率が10%以下であり、可視光線の平均透過率が65%以上であり、 $L^* a^* b^*$ 表色系における色調が、 $-3 \leq a^* \leq 3$ 、且つ $3 \leq b^* \leq 3$ であることを特徴とする。また、請求項4に係る近赤外線遮蔽フィルムは、前記透明樹脂フィルム層(1)と、前記透明近赤外線遮蔽層(2)と、前記透明樹脂フィルム層(3)と、前記透明色調補整層(4)とは、この順に積層されてなることを特徴とする。

【0010】更に、請求項5に係る近赤外線遮蔽フィルムは、前記透明近赤外線遮蔽層(2)及び/または前記透明色調補整層(4)を形成する樹脂が、ガラス転移点が70°C以上の熱可塑性樹脂であることを特徴とする。更に、請求項6に係る近赤外線遮蔽フィルムは、前記熱可塑性樹脂が、ポリエステル系樹脂、アクリル系樹脂のいずれかであることを特徴とする。更に、請求項7に係

る近赤外線遮蔽フィルムは、前記ジイモニウム系化合物の融点が、190°C以上であることを特徴とする。更に、請求項8に係る近赤外線遮蔽フィルムは、前記色材が、波長560~590nmの可視光線を選択的に吸収する色材であることを特徴とする。更に、請求項9に係る近赤外線遮蔽フィルムは、前記の近赤外線遮蔽フィルムの両面又は片面に、紫外線吸収剤を含有する透明粘着層(5)を積層し、その上に離型フィルム層(6)を積層してなることを特徴とする。

【0011】

【発明の実施の形態】この実施の形態に係る近赤外線遮蔽フィルムは、図1に示すように、透明樹脂フィルム層1と、近赤外線吸収剤として前記一般式で表されるジイモニウム系化合物を必須成分として含有する樹脂組成物を前記透明樹脂フィルム層1上に塗工して形成・積層された透明近赤外線遮蔽層2と、この透明近赤外線遮蔽層2上に形成・積層された透明樹脂フィルム層3と、前記透明近赤外線遮蔽層2の色調を補整する色材を含有する



Rは互いに同一若しくは相異なる水素、アルキル基(メチル基、エチル基、プロピル基、ブチル基等)、アリール基、ヒドロキシ基、フェニル基、ハロゲン化アルキル基等であり、Xは過塩素酸イオン、フッ化硼素酸イオン、ヘキサフルオロ硫酸イオン、ヘキサフルオロアンチモン酸イオン、トリフルオロ酢酸イオン、ピクリン酸イオン、ベンゼンスルホン酸イオン、リン酸イオン、硫酸イオン、塩化物イオン等であり、具体的にはN,N,N',N'-テトラキス(p-ジエチルアミノフェニル)-p-ベンゾキノン-ビス(イモニウム)・ヘキサフルオロアンチモン酸塩等が例示できる。これらは適宜合成して使用することもできるが、日本化薬(株)製IRG-022、IRG-040、日本カーリット(株)製CIR-1080、CIR-1081、CIR-1083等が市販されており、それらを使用することも可能である。

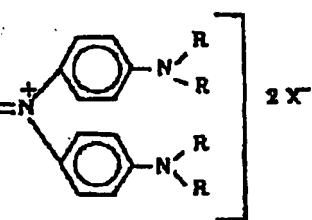
【0014】これらのジイモニウム系化合物は、近赤外領域にモル吸光係数εが約10万程度の大きな吸収を有し、波長400~500nmの可視光領域に若干吸収があり薄い黄褐色~緑色の色調を呈するものの、可視光透過性が他の近赤外線吸収剤よりも優れているため、前記近赤外線遮蔽フィルムに用いて好適なものである。ジイモニウム系化合物の配合量は、該近赤外線吸収剤を含有する透明近赤外線遮蔽層2の厚みに依存するが、十分な周辺機器の誤動作防止機能を発現するためには波長850~1000nmの近赤外線透過率が10%以下になるように

樹脂組成物を塗工して形成・積層された透明色調補整層4と、紫外線吸収剤を含有し、前記透明樹脂フィルム層1の上層(図1では下層)に形成・積層された透明粘着層5と、この透明粘着層5の上層(図1では下層)に形成・積層された離型フィルム層6からなる多層構造を有する。

【0012】このような構成にしたことにより、近赤外線遮蔽フィルムは、プラズマディスプレイ用近赤外線遮蔽フィルターとして実用的で高度な近赤外線遮蔽性と可視光透過性、及び優れたカラーバランスを有するフィルムが得られる。ここに、透明粘着層5と離型フィルム層6は、必ずしも透明樹脂フィルム層1側に設けられる必要はなく、透明色調補整層4上に、透明粘着層5と離型フィルム層6をこの順に積層してもよい。

【0013】ジイモニウム系化合物は、次の一般式で表される化合物で、

【化3】



する必要がある。そのためには、透明近赤外線遮蔽層2の厚みを5~50μm程度として設計した場合には、樹脂固形分に対する近赤外線吸収剤の配合量を0.3~5.0重量%程度とすれば良い。透明近赤外線遮蔽層2を形成する樹脂に対する近赤外線吸収剤の過剰の配合は透明近赤外線遮蔽層2中での前記近赤外線吸収剤の偏析や可視光透過性の低下を招くので好ましくない。

【0015】また、波長850~900nmの近赤外線を前記ジイモニウム系化合物と他の近赤外線吸収剤とを配合して遮蔽してもよく、この場合は、波長850nm付近に吸収極大を有するフタロシアニン系化合物や、ジチオールニッケル錯体、例えビス(ジチオベンジル)ニッケル錯体等の有機金属錯体等を用いてもよい。しかし、前者は可視光領域の透過性が低く、また後者はジイモニウム系化合物を還元し変質させる触媒作用を有するため、これらの近赤外線吸収剤は透明色調補整層4に配合する方が良く、当該透明近赤外線遮蔽層2中ではジイモニウム系化合物を単独で配合した方が良い。

【0016】また、実用的な耐久性を付与するにはジイモニウム系化合物は融点が190°C以上のものを使用することが望ましい。融点が190°C以下のものは高温高湿度下において変質しやすく、190°C以上のものは、後述の好適な樹脂種の選択と併せて、実用上良好な耐久性を得ることができる。

【0017】透明近赤外線遮蔽層2及び/または透明色

調補整層4を形成する樹脂は、実用的な耐久性を付与するため、ガラス転移点が70°C以上の熱可塑性樹脂であって、ポリエステル系樹脂、アクリル系樹脂のいずれかであることが望ましく、好ましくはトルエン、メチルエチルケトン、メチルイソブチルケトン等の汎用溶剤に可溶性の樹脂が良い。この樹脂のガラス転移点が70°C未満であると、長時間プラズマディスプレイ表面の高温に曝された場合に、樹脂が軟化すると同時に透明近赤外線遮蔽層2中のジイモニウム系化合物が変質を受けやすく、カラーバランスが損なわれたり、近赤外線の遮蔽性が低下する等、長期の安定性に問題がある。これに対して、ガラス転移点が70°C以上であれば熱による変質を抑制することが可能となる。一方、エポキシ系、ウレタン系等の熱硬化型の樹脂は、成分中に含まれる活性な反応基がジイモニウム系化合物と反応し、塗膜の光学的特性が著しく損なわれるため、使用することができない。以上の要件を満たす樹脂としては、ポリエステル系樹脂、アクリル系樹脂等が好適に用いられる。

【0018】透明樹脂フィルム層1と透明樹脂フィルム層3を構成する透明樹脂フィルムは、前記の各層を積層したときに光透過性に支障がなければ特に限定されるものではないが、ポリエステル系、アクリル系、ポリカーボネート系、セルロース系、ウレタン系等が挙げられ、透明近赤外線遮蔽層2や色調補整層4との屈折率差の点でポリエステル系、アクリル系が好ましい。また、透明樹脂フィルム層1と透明樹脂フィルム層3を構成する透明樹脂フィルムの厚みは、10~125μmが作業性、ヘイズ値の面から好ましい。

【0019】透明色調補整層4は、前記ジイモニウム系化合物を含有する前記透明近赤外線遮蔽層2の黄褐色~緑色の色調を中性化してカラーバランスを整えるために、それらの補色となるような色材を含有しているのが好ましい。この色材としては、無機系顔料、有機系顔料、有機系染料、色素等一般的なものが挙げられる。無機顔料としては、コバルト化合物、鉄化合物、クロム化合物等が挙げられ、有機顔料としては、アゾ系、インドリノン系、キナクリドン系、バット系、フタロシアニン系、ナフタロシアニン系等が挙げられ、前記有機系染料及び色素には、アゾ系、アジン系、アントラキノン系、インジゴイド系、オキサジン系、キノフタロン系、スクワリウム系、スチルベン系、トリフェニルメタン系、ナフトキノン系、ピラロゾン系、ポリメチレン系等が挙げられるが、これらの内で、発色性と耐久性の兼合いから有機系顔料が好適に用いられる。

【0020】また、前記の色材として、波長560~590nmの可視光線領域に選択的に吸収を有する色材を用いることにより、プラズマディスプレイからのネオンガスの発光による不要光を遮蔽して色純度を改善して画質を良くする機能を付加することが好ましい。このような色材には、例えばジメチルキナクリドンのような有機系顔

料が挙げられる。そして、色材と共に波長850~900nmの領域に吸収極大を有するジチオールニッケル錯体等の有機金属錯体を配合することにより、近赤外線遮蔽性を補完することが好ましい。そして、これら数種の色材の配合量は、当該近赤外線遮蔽フィルムのL* a* b* 表色系における色調が、-3≤a*≤3、且つ-3≤b*≤3となるように、前記透明色調補整層(4)の膜厚と、樹脂固形分量と、色材量から配合量を決定すれば良い。

【0021】また、近赤外線遮蔽フィルムを、プラズマディスプレイ用光学フィルタとして用いる場合、可視光の平均透過率は、画面の輝度とコントラストの兼ね合いから50~60%とすることが好ましいが、前記近赤外線遮蔽フィルムは実際には他の電磁波シールドフィルム、反射帯電防止フィルム等と積層して使用されるため、積層化による透過損失を考慮すると、近赤外線遮蔽フィルムの可視光平均透過率は、65%以上であることが好ましい。また、当該透明近赤外線遮蔽層、透明色調調整層、透明粘着層には必要に応じ、塗膜を形成する樹脂の耐湿性及び耐熱性を改善するため、一般的に用いられる酸化防止剤を添加しても良い。酸化防止剤には、芳香族アミン系、ヒンダードフェノール系等があり、多種多様なものが市販されているが、前者は着色する傾向があり、ヒンダードフェノール系のものが好ましい。

【0022】近赤外線遮蔽フィルムのいずれかの片面または両面には、紫外線光によるジイモニウム系化合物の変質を防ぎ、耐光性を改善するため、粘着剤等に紫外線吸収剤を配合した紫外線遮蔽層としての透明粘着層5を設けることが好ましい。紫外線吸収剤としては、ベンゾフェノン系、ベンゾトリアゾール系等が挙げられる。また、透明粘着層5を介して、透明基材、例えばフィルターベース等に、この近赤外線遮蔽フィルムを容易に貼り付けることができる。更に、透明粘着層5を積層する場合には、その上層(粘着面)にポリエチレン系等の離型フィルム層6を貼付しておくことが、作業性の点で好ましい。

【0023】この実施の形態に係る近赤外線遮蔽フィルムは、例えば、次のようにして製造することができる。まず、透明近赤外線遮蔽層2を形成する樹脂を、所定量のジイモニウム系化合物等と共に、溶剤に溶解或いは分散処理して樹脂組成物を調製し、この樹脂組成物をバーコーター、ロールコーナー、スリットダイコーナー等の通常の塗工装置を用いて、透明樹脂フィルム層1を構成する透明樹脂フィルム上に塗布し、溶剤を乾燥蒸発させて、近赤外線遮蔽層2が積層された透明樹脂フィルムAを形成する。一方、透明色調補整層4を形成する樹脂を、色調調整用の前記色材等と共に、溶剤に溶解或いは分散処理して樹脂組成物を調製し、この樹脂組成物をバーコーター、ロールコーナー、スリットダイコーナー等の通常の塗工装置を用いて、透明樹脂フィルム層3を構

成する透明樹脂フィルム上に塗布し、溶剤を乾燥蒸発させて、色調補整層4が積層された透明樹脂フィルムBを形成する。なお、色材の平均粒子径は0.01～10μmの範囲内であることが、透明性、発色性及び樹脂組成物の経時安定性の面から好ましい。

【0024】次いで、透明樹脂フィルムAと透明樹脂フィルムBとを積層する。この際、両透明樹脂フィルムの貼り合せは、近赤外線遮蔽層2と、透明樹脂フィルムBの色調補整層4が積層されていない面とを対面させ、近赤外線遮蔽層2を形成する樹脂の軟化点以上の温度で加熱ラミネートすることが好ましい。この場合、色調補整層4が同様に軟化してヒートロールに融着する不具合が生じる場合には、透明樹脂フィルムAと透明樹脂フィルム層3を構成する透明樹脂フィルムとを予め加熱ラミネートしておき、その後、透明樹脂フィルム表面に色調補整層4を積層しても良い。また、透明基材、例えばプラズマディスプレイ前面板の表面に、透明樹脂フィルムAと透明樹脂フィルムBとを順次ラミネートして、前述の積層形態にしても差し支えない。

【0025】なお、透明樹脂フィルムAの近赤外線遮蔽層2と、透明樹脂フィルムBの色調補整層4とを対面させて積層した場合、または、近赤外線遮蔽層2が露出するよう透明樹脂フィルムAと透明樹脂フィルムBとを積層し、近赤外線遮蔽層2上に透明粘着層5を設けた場合は、いずれの場合も高温高湿度下でジイモニウム系化合物の変質が促進される傾向がある。このようにして製造された近赤外線遮蔽フィルムは、プラズマディスプレイ用光学フィルタの他に、例えば、自動車用熱線遮蔽ガラス、複層ガラス等に好適に用いることができる。

【0026】

【実施例】以下、実施例及び比較例を具体的に説明する。なお、各実施例及び比較例で得た近赤外線遮蔽フィルムが積層された試料の光学特性の測定方法、及び耐久性の評価方法は次の通りである。

(全光線透過率、及びヘイズ値の測定) 東京電色工業(株) 製ヘイズメータ MODEL TC-H3DPK を用い、各試料から切り出した60×60mm角の試験片の全光線透過率T及びヘイズ値Hを測定した。各数値は室内の空気の透過率、ヘイズ値を比較対照した。

【0027】(色調の測定) 東京電色工業(株) 製カラーナライザー TOPSCAN TC-1800- MK IIを用い、各試料から切り出した60×60mm角の試験片のL* a* b* 表色系のL*、a*、b* 値を測定した。なお、標準光としてD₆₅、入射角±2°にて測定した。

【0028】(分光透過率の測定) 日本分光(株) 製分光光度計 V-570を用い、各試料から切り出した60×60mm角の試験片の850nm、900nm、1000nmにおける透過率T₈₅₀、T₉₀₀、T₁₀₀₀を測定した。各数値は室内の空気の透過率を比較対照とした。

【0029】(耐湿性の評価) 東京理化器械(株) 製恒

温恒湿試験器 KCH-1000 を用い、温度60℃、湿度90%RHに設定し、1000時間試験後の各試料のT、H、L*、a*、b*、T₈₅₀、T₉₀₀、T₁₀₀₀の各測定値の変化量が2ポイント未満のものを○とし、2ポイント以上のものを×とした。

【0030】(耐熱性の評価) いすゞ製作所(株) 製定温恒温器を用い、温度80℃に設定し、1000時間試験後の各試料のT、H、L*、a*、b*、T₈₅₀、T₉₀₀、T₁₀₀₀の各測定値の変化量が2ポイント未満のものを○とし、2ポイント以上のものを×とした。

【0031】(耐光性の評価) ヘレス(株) 製キセノンフェードメータ SUNTEST CPS+ を用いて、照度500W/m²、温度60℃に設定し、400時間試験後の各試料のT、H、L*、a*、b*、T₈₅₀、T₉₀₀、T₁₀₀₀の各測定値の変化量が2ポイント未満のものを○とし、2ポイント以上のものを×とした。なお、紫外線吸収層を片面にのみ設ける場合には、紫外線吸収層側から紫外線を照射するように試験した。

【0032】〔実施例1〕市販の飽和共重合ポリエスチル樹脂(ガラス転移温度70℃)：15重量部と、近赤外線吸収剤としてジイモニウム系化合物(N,N,N',N'-テトラキス(p-ジエチルアミノフェニル)-p-ベンゾキノン-ビス(イモニウム)・ヘキサフルオロアンチモン酸塩、融点200℃)：0.2重量部と、メチルエチルケトンとトルエンの1:1混合溶剤：84.8重量部に溶解混合した樹脂組成物を、市販のポリエチレンテレフタレートフィルム(48μm厚)上に乾燥塗膜の厚みが20μmとなるように塗工して、近赤外線吸収剤としてジイモニウム系化合物を含有する近赤外線遮蔽層が積層された透明樹脂フィルムA1を得た。

【0033】また、前記飽和共重合ポリエスチル樹脂(ガラス転移温度70℃)：15重量部、近赤外線吸収剤としてビス(ジチオベンジル)ニッケル錯体：0.15重量部、予め分散処理した紫色有機系顔料(大日本インキ化学工業(株) 製 FastogenSuper Violet RN)：0.05重量部及び青色有機系顔料(東洋インキ製造(株) 製 Lionol Blue ES)：0.025重量部を、メチルエチルケトンとトルエンの1:1混合溶剤：84.775重量部に溶解混合した樹脂組成物を、前記ポリエチレンテレフタレートフィルム(48μm厚)上に、乾燥塗膜の厚みが10μmとなるように塗工して、色調補整層が積層された透明樹脂フィルムB1を得た。

【0034】次いでこの透明樹脂フィルムB1の前記色調補整層上に、紫外線吸収剤(チバ・スペシャルティ・ケミカルズ(株) 製 TINUVIN 384)：2.7重量部、酸化防止剤(チバ・スペシャルティ・ケミカルズ(株) 製 IRGANOX-1010)：0.9重量部、アクリル系粘着剤(東亜合成(株) 製アロンS-1601)：96.4重量部を混合して得た混合物を、乾燥塗膜の厚みが15μmとなるよう塗工して紫外線吸収剤を含有する透明粘着層を積層し

た。

【0035】この粘着加工を施した色調調整フィルムB1の粘着面を、ロールラミネータにより厚さ3mmの強化ガラス基材に貼り付け、更にジイモニウム系化合物塗工フィルムA1を、ジイモニウム系化合物塗工フィルムの塗工面と色調調整フィルムの透明樹脂フィルム面とが対面するように、強化ガラス基材に温度140°Cで加熱ラミネートして、実施例1としての近赤外線遮蔽フィルムが強化ガラス基材上に積層された試料1を得た。この試料1の初期光学特性と、各耐久性試験後の光学特性とをそれぞれ測定し、その結果を表1にまとめた。

【0036】〔実施例2〕市販のアクリル樹脂（ガラス転移温度105°C）：15重量部と、近赤外線吸収剤としてジイモニウム系化合物（日本化薬（株）製IRG-040、融点246°C）：0.3重量部とを、メチルエチルケトンとトルエンの1：1混合溶剤：84.7重量部に溶解混合した樹脂組成物を、市販のポリメタクリル樹脂フィルム（50μm厚）上に、乾燥塗膜の厚みが20μmとなるように塗工して、近赤外線吸収剤ジイモニウム系化合物を含有する近赤外線遮蔽層が積層された透明樹脂フィルムA2を得た。

【0037】次に、この透明樹脂フィルムA2と、別の前記ポリメタクリル樹脂フィルム（50μm厚）とを、前記近赤外線遮蔽層を介して温度180°Cで加熱ラミネートし、ラミネートフィルムを得た。次いで、前記アクリル樹脂：15重量部と、予め分散処理した紫色有機系顔料（大日本インキ化学工業（株）製Fastogen Super Violet RN）：0.05重量部及び青色有機系顔料（東洋インキ製造（株）製Lionol Blue ES）：0.025重量部を、メチルエチルケトンとトルエンの1：1混合溶剤84.925重量部に溶解混合した樹脂組成物を、前記ラミネートフィルム上に、乾燥塗膜の厚みが10μmとなるように塗工して、色調調整層が積層されたラミネートフィルムB2を得た。

【0038】更にこの色調調整層上に、予め離型フィルム（ポリエチレンフィルム）の表面に紫外線吸収剤（チバ・スペシャルティ・ケミカルズ（株）製TINUVIN 384）：2.7重量部、酸化防止剤（チバ・スペシャルティ・ケミカルズ（株）製IRGANOX-1010）：0.9重量部、アクリル系粘着剤（東亜合成（株）製アロンS-1601）：96.4重量部を混合して得た混合物を、乾燥塗膜の厚みが15μmとなるよう塗工した離型フィルムの紫外線吸収剤を含有する粘着面を、ロールラミネータにより貼り付け合わせて、実施例2としての近赤外線遮蔽フィルムとした。この実施例2の近赤外線遮蔽フィルムを、ロールラミネータ装置を用いて前記離型フィルムを剥離しながら、厚さ3mmの強化ガラス基材に貼り付けて試料2とした。この試料2の初期光学特性と、各耐久性試験後の光学特性とをそれぞれ測定し、その結果を表1にまとめた。

【0039】〔実施例3〕色調調整層4に用いる有機系顔料（クラリアント・ジャパン（株）製Hostaparm Red-Violet ER-02）：0.075重量部を用いた以外は実施例1に準じ、実施例3としての近赤外線遮蔽フィルムが強化ガラス基材上に積層された試料3を得た。この試料3の初期透過スペクトルを図-2に示した。また、この試料3の初期光学特性と、各耐久性試験後の光学特性とをそれぞれ測定し、その結果を表1にまとめた。

【0040】〔比較例1〕市販の飽和共重合ポリエステル樹脂（ガラス転移温度65°C）：15重量部、近赤外線吸収剤のジイモニウム系化合物（N,N,N',N'-テトラキス（p-ジエチルアミノフェニル）-p-ベンゾキノン-ビス（イモニウム）・ヘキサフルオロアンチモン酸塩、融点200°C）：0.2重量部、近赤外線吸収剤のビス（ジチオベンジル）ニッケル錯体：0.20重量部、近赤外線吸収剤のフタロシアニン系化合物：0.10重量部を、メチルエチルケトンとトルエンの1：1混合溶剤84.8重量部に溶解混合した樹脂組成物を、市販のポリエチレンテレフタレートフィルム（48μm厚）上に、乾燥塗膜の厚みが20μmとなるように塗工した。

【0041】次いでこのフィルムの塗工面と反対側の面に、紫外線吸収剤（チバ・スペシャルティ・ケミカルズ（株）製TINUVIN 384）：2.7重量部、酸化防止剤（IRGANOX-1010）：0.9重量部、アクリル系粘着剤（東亜合成（株）製アロンS-1601）：96.4重量部を混合して得た混合物を、乾燥塗膜の厚みが15μmとなるよう塗工して粘着加工を施した。この粘着加工を施したフィルムの粘着面を、ロールラミネータにより厚さ3mmの強化ガラス基材に貼り付け、試料4とした。この試料4の初期光学特性と各耐久性試験後の光学特性とをそれぞれ測定し、その結果を表1にまとめた。

【0042】〔比較例2〕市販のアクリル樹脂：20重量部、近赤外線吸収剤のジイモニウム系化合物（N,N,N',N'-テトラキス（p-ジエチルアミノフェニル）-p-ベンゾキノン-ビス（イモニウム）・ヘキサフルオロアンチモン酸塩、融点200°C）：0.07重量部、近赤外線吸収剤のビス（ジチオベンジル）ニッケル錯体：0.07重量部をメチルエチルケトン：79.84重量部に溶解した樹脂組成物を、キャスト法によりステンレス板上で溶剤を揮発させ、厚さ50μmのフィルムとした。

【0043】次いでこのフィルムに、紫外線吸収剤（チバ・スペシャルティ・ケミカルズ（株）製TINUVIN 384）：2.7重量部、酸化防止剤（チバ・スペシャルティ・ケミカルズ（株）製IRGANOX-1010）：0.9重量部、アクリル系粘着剤（東亜合成（株）製アロンS-1601）：96.4重量部を混合して得た混合物を、乾燥塗膜の厚みが15μmとなるよう塗工して粘着加工を施した。この粘着加工を施したフィルムの粘着面を、ロールラミネータにより厚さ3mmの強化ガラス基材に貼り付

け、試料5とした。この試料5の初期光学特性と各耐久性試験後の光学特性とをそれぞれ測定し、その結果を表1にまとめた。

【0044】〔比較例3〕市販のアクリル樹脂：100重量部に対して、近赤外線吸収剤のジイモニウム系化合物（N, N, N', N' - テトラキス（p-ジエチルアミノフェニル）-p-ベンゾキノン-ビス（イモニウム）・ヘキサフルオロアンチモン酸塩、融点 200°C）：0.005重量部、近赤外線吸収剤のビス（ジチオベンジル）ニ

ッケル錯体：0.005重量部を添加して、射出成形機のシリンダー内温度を 220°Cとして均一に混練し、加熱押し出し成形により厚さ 4mmのシート状に成形して、これを試料6とした。この試料6の初期光学特性と各耐久性試験後の光学特性とをそれぞれ測定し、その結果を表1にまとめた。

【0045】

【表1】

No.	初期光学特性						耐熱性評価	耐光性評価
	T(%)	H(%)	L*	a*	b*	T ₅₀₀ (%)		
実施例1	85.6	2.6	83.8	0.2	-2.7	7	4	○○○×
実施例2	86.1	1.2	84.1	-0.8	-2.6	7	3	○○○×
実施例3	69.5	2.0	85.7	0	2.5	8	4	○○○×
比較例1	58.4	2.0	78.6	-0.2	2.4	7	5	○○○×
比較例2	63.0	2.1	81.4	-5.9	7.5	6	4	○○○×
比較例3	74.8	1.1	88.9	-6.8	8.8	10	15	○○○×

【0046】「評価結果」表1の結果から、実施例1～実施例3に係る試料1～試料3は、いずれも、初期特性において高度な近赤外線遮蔽性と可視光透過性、良好なカラーバランスを有することが分かる。また、実施例1

～実施例3に係る試料1～試料3は、いずれも、各耐久試験後の各光学特性の変化量がいずれも2ポイント未満であり、実用的な耐久性を有していることが判る。更に、試料3は、580nmを中心として選択吸収性を有す

ることが判る。

【0047】これに対して、比較例1に係る色調補正層が設けられていない試料4は、初期特性において高度な近赤外線遮蔽性と良好なカラーバランスを有するものの、可視光透過性が低くことが判り、また、各試験後の光学特性変化から、実用上の耐久性に問題を有している。また、比較例2に係る色調補整層が設けられていない試料5は、初期特性において高度な近赤外線遮蔽性を有するものの、可視光透過性が低く、カラーバランスが悪いことが判り、また、耐湿性・耐光性試験後の光学特性の変化から、実用上の耐久性に問題を有している。更に、比較例3に係る色調補整層と紫外線吸収剤含有層が設けられていない試料6は、初期特性において可視光透過性は高いものの、近赤外線遮蔽性とカラーバランスが悪いことが判り、また、耐湿性・耐光性試験後の光学特性の変化から、実用上の耐久性に問題を有している。

【0048】

【発明の効果】以上のように、本発明による請求項1に係る近赤外線遮蔽フィルムでは、透明樹脂フィルム層(1)と、近赤外線吸収剤としてジイモニウム系化合物を含有する透明近赤外線遮蔽層(2)と、透明樹脂フィルム層(3)と、前記透明近赤外線遮蔽層(2)の色調を補整する色材を含有する透明色調補整層(4)とを積層した多層構造を有することにより、高度な近赤外線遮蔽性と可視光透過性を兼備し、透過色のカラーバランスに優れるとともに、実用的な耐久性を有し、且つ生産性が良好であり、更には可視光領域の不要光を選択的に遮蔽して画質を向上させ得るプラズマディスプレイ用光学フィルター等に用いて好適な近赤外線遮蔽フィルムができる。

【0049】請求項2に係る近赤外線遮蔽フィルムでは、前記ジイモニウム系化合物は、一般式【化1】で表される化合物であるから、近赤外線領域にモル吸光係数 ϵ が約10万程度の大きな吸収能を有し、可視光透過率が他の近赤外線吸収剤よりも優れており、近赤外線遮蔽フィルムとして好適に使用することができる。

【0050】請求項3に係る近赤外線遮蔽フィルムでは、波長850~1000nmの近赤外線の透過率が10%以下、可視光線の平均透過率が65%以上、 $L^* a^* b^*$ 表色系における色調が、 $-3 \leq a^* \leq 3$ 、且つ $-3 \leq b^* \leq 3$ であることにより、周辺機器の誤動作防止機能を充分に発揮することができ、カラーバランスに優れた近赤外線遮蔽フィルムとして好適に使用することができ

る。

【0051】請求項4に係る近赤外線遮蔽フィルムでは、前記透明樹脂フィルム層(1)と、前記透明近赤外線遮蔽層(2)と、前記透明樹脂フィルム層(3)と、前記透明色調補整層(4)とが、この順に積層されてなることにより、実用的な近赤外線遮蔽性と可視光透過性、および優れたカラーバランスを有し、耐久性に優れた近赤外線遮蔽フィルムを構成することができる。

【0052】請求項5に係る近赤外線遮蔽フィルムでは、前記透明近赤外線遮蔽層(2)及び/または前記透明色調補整層(4)を形成する樹脂が、ガラス転移点が70°C以上の熱可塑性樹脂であることにより、ジイモニウム系化合物の変質を抑制することができ、実用的な耐久性を向上させることができる。

【0053】請求項6に係る近赤外線遮蔽フィルムでは、前記熱可塑性樹脂がポリエステル系樹脂、アクリル系樹脂のいずれかであることにより、透明近赤外線遮蔽層(2)や透明色調補整層(4)の透明性、溶剤への溶解性、塗工性の点で好適な近赤外線遮蔽フィルムを得ることができる。

【0054】請求項7に係る近赤外線遮蔽フィルムでは、前記ジイモニウム系化合物の融点が190°C以上であることにより、高温高湿度下における変質を抑制でき、好適な樹脂種の選択と併せて実用上良好な耐久性を得ることができる。

【0055】請求項8に係る近赤外線遮蔽フィルムでは、前記色材が波長560~590nmの可視光線を選択的に吸収する色材であることにより、プラズマディスプレイからのネオンガス発光による不要光を遮断して色純度を改善し、画質を向上することができる。

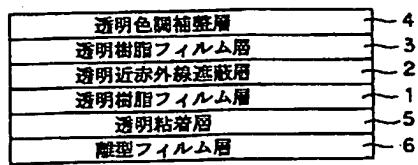
【0056】請求項9に係る近赤外線遮蔽フィルムでは、請求項1に記載の近赤外線遮蔽フィルムの両面又は片面に、紫外線吸収剤を含有する透明粘着層(5)を積層し、その上に離型フィルム層(6)を積層したことにより、基材に近赤外線遮蔽フィルムを容易に貼り付けることができるとともに紫外線によるジイモニウム系化合物の変質が防止でき、耐光性を向上することができる。

【図面の簡単な説明】

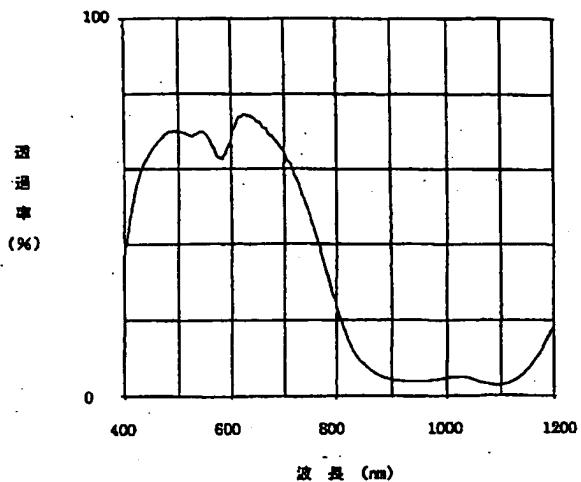
【図1】本発明による近赤外線遮蔽フィルムの構成を示す断面説明図である。

【図2】本発明における実施例3で得られた試料3の初期透過スペクトルを示すグラフである。

【図1】



【図2】



フロントページの続き

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